Abstract of the disclosure

In this invention, a contact type micro piezoresistive shear-stress sensor is fabricated by the micro-electro-mechanical (MEMS) technology, and its main sensing part is a 2-X shaped with a flange structure, for measuring the shear stress distribution between socket of above-knee (AK) prostheses and the soft tissue of amputee's stump. Comparing with a conventional shear stress sensor, this invention owns the following characteristics: piezo-resistivity of the monolithic silicon will be utilized to convert shear deformation of the sensor into electrical signal and a micro sensor which can measure the shear force vector acting the sensing flange.

The preparation processes of this invention are described as followings: A $3000\times3000\times300\ \mu m^3$ diaphragm is prepared by anisotropic wet etching of bulk silicon in KOH solution and a square flange with $1100\times1100\times3\ \mu m^3$ above the sensing diaphragm is formed through surface micromachining of deposited SiO_2 thin film. With ion implantation, two X-shapes were placed at the closely middle points between mid-edge points and center of the diaphragm where less sensitivity to normal pressure and higher sensitivity to shear stress. The sensitivity of 3.6uv/mA-Kpa for a 70 Kpa full scale (FS) shear-stress range with shear-stress hysteresis errors of less than 8.9%FS has been measured in the developed shear-stress sensor.